WHAT WE CLAIM IS:

1. A micro-pillar structure, characterized in that micro-pillars are regularly arranged on a substrate surface.

2. A micro-pillar structure having a water-repellent surface, characterized in that micro-pillars are regularly arranged on a substrate surface, and have water repellency.

3. A micro-pillar structure having a hydrophilic surface, characterized in that micro-pillars are regularly arranged on a substrate surface, and are made hydrophilic by a hydrophilicity-imparting treatment.

4. A micro-pillar structure according to any one of claims 1 to 3, wherein said substrate and said micro-pillars comprise a polymer and, if required, includes a modifier.

5. A micro-pillar structure according to any one of claims 1 to 4, wherein said substrate and said micro-pillars use as a precursor a porous honeycomb structure comprising a polymer and, if required, including a modifier, and said structure is obtained by sectioning said precursor by peeling in a thickness direction.

6. A micro-pillar structure according to claim 5, wherein said precursor or the substrate obtained from said precursor is in a thin-film form.

7. A micro-pillar structure according to any one of claim 1 to 5, wherein said micro-pillars are arranged at a length of 0.1 to 50 μm, a tip length of 0.01 to 20 μm

and a spacing of 0.1 to 100 μm.

8. A micro-pillar structure according to claim 4 or 5, wherein said polymer includes a hydrophobic or biodegradable polymer, and includes an amphiphilic polymer.

9. A micro-pillar structure according to claim 8, wherein said polymer comprises 50 to 99% of said hydrophobic polymer and/or said biodegradable polymer with the rest being said amphiphilic polymer.

10. A micro-pillar structure according to claim 8 or 9, wherein a polyester, a poly(meth)acrylate, a polycarbonate or a polystyrene is used as said hydrophobic or biodegradable polymer.

11. A micro-pillar structure according to any one of claims 1 to 10, characterized in that a solution having a polymer dissolved in a hydrophobic organic solvent is cast on a substrate, said organic solvent is evaporated in a moist atmosphere to condense moisture contained in an atmosphere prevailing on a surface of said cast solution into micro-droplets, said micro-droplets are dispersed on the surface of said cast solution or in said cast solution into a close-packed structure, said micro-droplets, condensed and dispersed on the surface of said cast solution or in said cast solution, are evaporated to obtain a porous honeycomb structure with said droplets used as casts, and said porous honeycomb structure is at least bisected by peeling in a thickness direction, thereby obtaining honeycomb structures wherein micro-pillars are regularly formed and arranged by said

bisection on peeled sections.

12. A micro-pillar structure according to any one of claims 1 to 11, characterized in that said micro-pillars are oriented in any direction except for a vertical direction and set with anisotropy.

13. A micro-pillar structure according to claim 12, characterized in that said anisotropic micro-pillars are obtained by a peeling treatment including transverse shearing stress in such a way that when the porous honeycomb structure that is a micro-pillar precursor is sectioned by peeling in the thickness direction, the resulting micro-pillars are oriented in any direction except for the vertical direction.

14. A micro-pillar structure according to claim 3, wherein said hydrophilicity-imparting treatment is any one or a combination of a chemical modification treatment, an ozone oxidization treatment and an alkali treatment.

15. A process for preparing a micro-pillar structure, characterized in that a solution having a polymer dissolved in a hydrophobic organic solvent is cast on a substrate, said organic solvent is evaporated in a moist atmosphere to condense moisture contained in an atmosphere prevailing on a surface of said cast solution into micro-droplets, said micro-droplets are dispersed on the surface of said cast solution or in said cast solution into a close-packed structure, said micro-droplets, condensed and dispersed on the surface of said cast solution or in said cast solution, are evaporated to

obtain a porous honeycomb structure with said droplets used as casts, and said porous honeycomb structure is at least bisected by peeling in a thickness direction, thereby obtaining honeycomb structures wherein micro-pillars are regularly formed and arranged by said bisection on peeled sections.

16. A process for preparing a micro-pillar structure according to claim 15, characterized in that said polymer is composed of a hydrophobic or biodegradable polymer and an amphiphilic polymer and, if required, a modifier is incorporated therein.

17. A process for preparing a micro-pillar structure according to claim 16, wherein said polymer comprises 50 to 99% of said hydrophobic polymer and/or said biodegradable polymer with the rest being said amphiphilic polymer.

18. A process for preparing a micro-pillar structure according to claim 16 or 17, characterized in that said hydrophobic or biodegradable polymer comprises a polymer having a polyester, a poly(meth)acrylate, a polycarbonate or a polystyrene as a basic skeleton.

19. A process for preparing a micro-pillar structure according to claim 15, wherein said moist atmosphere is adjusted to a relative humidity of 50 to 95%.

20. A process for preparing a micro-pillar structure according to claim 15 or 19, characterized in that said atmosphere is an ordinary air atmosphere.

21. A process for preparing a micro-pillar

structure according to claim 15, characterized in that operation for evaporation of said organic solvent in said moist atmosphere is carried out by blowing an atmosphere having a high humidity onto an evaporation interface of said organic solvent.

22. A process for preparing a micro-pillar structure according to claim 15, characterized in that peeling operation is carried out by use of an adhesive tape.

23. A process for preparing a micro-pillar structure according to claim 15, characterized in that peeling operation is carried out by dissolution of the polymer.

24. A process for preparing a micro-pillar structure according to claim 15, characterized in that peeling operation is carried out by ultrasonic irradiation.

25. A process for preparing a micro-pillar structure according to any one of claims 15 to 24, characterized in that said micro-pillars are arranged at a length of 0.1 to 50 μm, a tip length of 0.01 to 20 μm and a spacing of 0.1 to 100 μm.

26. A process for preparing a micro-pillar structure according to any one of claims 15 to 25 above, wherein said micro-pillars are oriented in any direction except for a vertical direction and set with anisotropy.

27. A process for preparing a micro-pillar structure according to claim 26, characterized in that

said anisotropic micro-pillars are obtained by a peeling treatment with transverse shearing stress in such a way that when the porous honeycomb structure that is a micro-pillar precursor is sectioned by peeling in the thickness direction, the resulting micro-pillars are oriented in any direction except for the vertical direction.